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report

# Activities '72 & '73

Government  
Publications



## The Centre of

# Forensic Sciences



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THE CENTRE OF FORENSIC SCIENCES

Activities Report

1972-73

This brief report is to advise judges, attorneys, police officers, other laboratories and allied institutions about some of the recent activities in the Centre. It is assumed that its readers already have some knowledge of the functions and aims of the Centre.

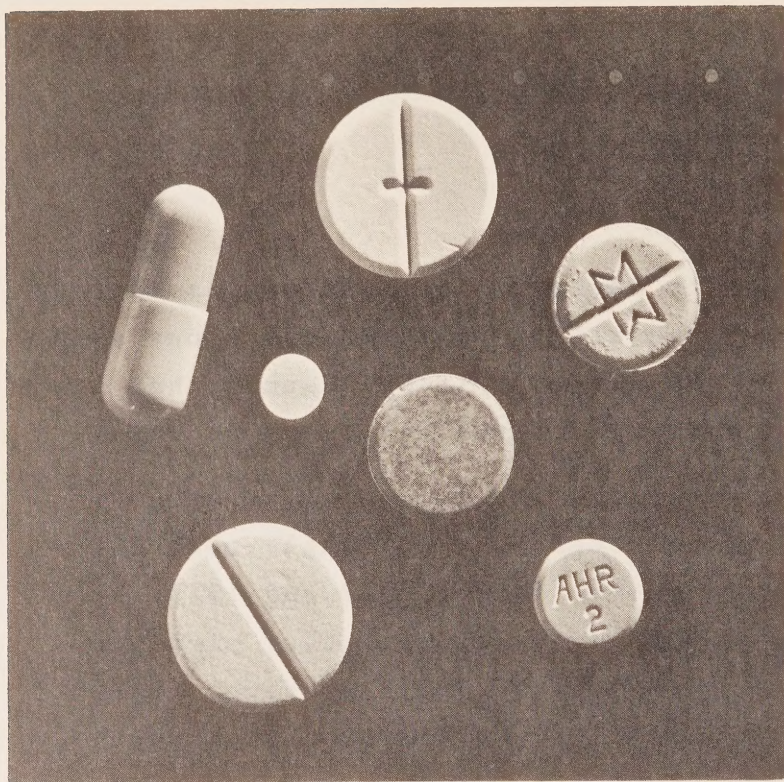
Part I focuses in brief detail on the single most significant development in each section during 1972 and 1973. This is followed by a summary of the sections' other significant activities. The sections are treated in order of size. Part II provides concise statistics regarding the services rendered by the Centre in 1972 and 1973.

Work on the new building to accommodate our facilities began late in 1971 and continued during 1972 and 1973. It is expected that completion will be late in 1974 or early in 1975 when 70,000 square feet of space will be available.

In addition to our regular educational programs for police and related groups at the Ontario Police College, the Metropolitan Police College and the Ontario Provincial Police Staff Development Centre and the various community colleges, the Centre provided a six-month training program in forensic applications of neutron activation analysis for a member of the staff of the Bhabha Atomic Research Centre in Bombay, India. This was under the auspices of the Canadian International Development Agency. Members of the staffs of forensic laboratories in Tanzania; London, England; Lausanne, Switzerland; Washington, D.C.; Cleveland, Ohio; Rochester, N. Y.; Alabama; New Jersey; North Carolina; Michigan; New York, N. Y.; Johannesburg, South Africa; Sweden; and Sydney, Australia visited us for varying periods of time to exchange information.



## Toxicology



With the widespread use of sleep-inducing drugs, tranquilizers, stimulants, "street" drugs, and other forms of medication, the determination of the presence of the various toxic substances in body specimens has become increasingly complex and time consuming. In an attempt to alleviate this problem, a procedure has been developed for group-screening of blood (and urine) for the presence of a number of common drugs by means of gas chromat-

ography. Whereas our previous methods allowed us to detect alcohol and two or three other drugs in 15 ml of blood, the new procedure enables us, on the same sample, to screen for about thirty of the commonly used drugs e.g. diazepam ("Valium"), methadone, propoxyphene ("Darvon") and methamphetamine ("speed"), when present in high therapeutic or toxic concentrations. Although an obvious improvement, especially for impaired driving cases, it should be emphasized that the screening procedure for blood is only of limited value in a comprehensive toxicological examination for which other specimens such as gastric contents and liver must be analyzed by different techniques. However, efforts directed to creating effective extraction and chromatographic conditions common to as many drugs as possible were rewarding and the new procedure was applied to selected casework late in 1973.

In one case a man was charged with impaired driving and a small sample of his urine was sent for examination. Tests for alcohol showed a concentration too small to account for his erratic driving. It was suspected that his condition was the cumulative



result of alcohol and another drug. There were no investigative leads pointing to a particular drug and therefore one or more of hundreds of available drugs might have been involved. The remainder of the small urine specimen was subjected to the gas-chromatographic screening procedure and the drug amitriptyline was found. This is generally prescribed as an anti-depressant and when used with alcohol could adversely affect the user's driving ability. Without the group screening procedure this drug would probably not have been found as the sample would have been insufficient for adequate examination.

#### Other Activities -

1. The capabilities of the Toxicology Section will be considerably enhanced when mass spectrometry equipment becomes available in the new building. For example, it may be possible to detect cannabinoids in the body fluids of marihuana smokers. An evaluation program has been undertaken to determine the best type of equipment for our needs.

2. Analytical procedures have been evaluated for phenothiazines, methadone, chloral hydrate, bromides and disulfuram. The procedure for the latter was found to be inefficient but efforts to improve it have so far not been successful. The procedure for the determination of methadone in body fluids was standardized and new procedures were developed for the determination of chloral hydrate, bromides and methylenedioxymphetamine (MDA).

3. The Breathalyzer programme continued to expand. Two hundred and eighty-three operators were trained and certified and all active operators were evaluated. Eighteen new units were installed and all existing units were inspected. The number of cases not involving driving where the Breathalyzer was used continued to decrease in 1972 and 1973 because of the reduction in 1971 in the legal age for the consumption of alcohol.

4. The increasing size of the section necessitated the appointment of a third assistant section head, Mr. D. Hall, B.A.

#### Publications

1. "Toxicological Data for Fatalities due to Carbon Monoxide and Barbiturates in Ontario"  
G. Cimbura, E. McGarry and J. Daigle;  
J. Forensic Sciences, 17, No. 4, p. 640 (1972).

2. "3-4-Methylenedioxyamphetamine (MDA) : Analytical and Forensic Aspects of Fatal Poisoning"  
G. Cimbura;  
J. Forensic Sciences, 17, No. 2, p. 329 (1972).
3. "Review of Methods of Analysis for Phenothiazine Drugs"  
G. Cimbura;  
J. Chromatog. Sciences, 10, p. 287, May 1972.
4. "Sniffables and Impaired Driving"  
D. M. Lucas and G. Cimbura;  
Crown Newsletter, December 1972.
5. "Determination of Chloral Hydrate and Trichloroethanol in Biological Tissue"  
J. Wells and G. Cimbura;  
J. Forensic Sciences, 17, No. 4, p. 674 (1972).
6. "Determination of Elevated Levels of Bromide in Blood by Gas-Chromatography"  
J. Wells and G. Cimbura;  
J. Forensic Sciences, 18, No. 4, p. 437 (1973).
7. "Suspected Homicidal Poisoning with Strychnine"  
C. A. Corley;  
Bulletin of the International Association of Forensic Toxicologists, 8, Nos. 3 and 4 (1972).
8. "Gas-Chromatographic Identification of Aldehydes and Ketones in Toxicological Analysis"  
J. Wells;  
J. Forensic Sciences, 18, No. 2, p. 152 (1973).
9. "The Use of Liquid Phase Poly A-103 in Toxicology"  
J. Wells, G. Cimbura, E. Koves;  
J. Chromatog. 86, p. 225 (1973).
10. "Suspected PMA Poisoning Cases"  
D. W. Robinson, G. Cimbura, J. Fenwick;  
Bulletin of the International Association of Forensic Toxicologists, 9, No. 344, Sept. 1973.



## Biology



A new system has been added to those already in use in the Biology Section to classify blood. It is based on the identification of EAP - (Erythrocyte Acid Phosphatase) polymorphs. The distribution of six polymorphs (groups) in the general population has been established as being approximately 2.5% of the population for the rarest and 47.7% of the population for the commonest.

The ABO system classifies blood into four basic types - A, B, O and AB. The factors which permit such classification are present on both the red cells as well as in the serum or liquid portion of the blood. Those present on the red cells are called antigens and those present in the serum are called antibodies. The kind of inter-action between the antigens and antibodies determines whether the blood is A, B, O or AB.

Other systems which depend on antigen-antibody reactions but which are unrelated to the ABO system include the Rh and MN systems.

Other classifications make use of the proteins and the enzyme systems present in blood. PGM (Phosphoglucosmutase) and AK (Adenylate Kinase) are enzyme systems. The PGM system has three groups - PGM1, PGM2 and PGM2-1 - and unlike the antigen-antibody systems, the PGM factors are located within the red blood cell, not on the surface. The identification of the PGM and AK groups is possible on a sample consisting of only two blood-soaked yarns 1/4" in length. The distribution of the various groups in the general population has also been established. For instance PGM2 occurs in 7.4% of the population, PGM 2-1 in about 37.6% and PGM1 in about 55%.



A protein system which is identifiable in blood stains is the Hp (Haptoglobin) system. Hp1 occurs in about 17% of the population, Hp2-1 in 48% and Hp2 in 35%. All these systems are now routinely used at the Centre depending on the nature, state and age of the sample received.

Some of the new systems including the EAP system were used in the following case:

A person was accused of assault and robbery. The victim was kicked during the assault and bled profusely. A blood sample from the victim revealed that his blood contained groups A, PGM-1, AK 2-1 and EAP-CA. This combination of blood groups is encountered in approximately one in a thousand of the general population. Blood staining containing the same combination of blood groups as that of the complainant was identified on the boots and trousers of the accused. Faced with this finding, a plea of guilty was entered.

#### Other Activities

1. A programme to further assess the various techniques for typing blood group substances in hairs according to the ABO system was undertaken with the help of a summer student. Although some good results were obtained, additional work is necessary to raise the level of confidence to the point necessary for case work.

2. An educational display "Examination of Textile Fibres in Criminal Investigation" was prepared.





traces of gasoline in the charred debris from incendiary fires.

Over the past few years methods have been developed in the Chemistry Section which enable us to make corrections for the presence of contaminants. Pine and other woods, synthetic fabrics, and plastics have been examined for the presence of gasoline, kerosene, naphthas and fuel oils both before and after charring in an open flame. The patterns their vapours gave on a gas chromatograph were noted. Petroleum products were then used as accelerants, the same materials were burned and the degree to which the contaminants interfered was determined by injecting a known quantity of vapours from the charred remains on to a column in the gas chromatograph noting the presence of foreign peaks and injecting the same quantity of vapours from materials containing the



suspected contaminants on to the same column. By analysis of the sample and the controls on at least two columns in the gas chromatograph, the potential confusion in identification caused by contaminants is removed.

It was further found that the simple process of heating the sample in an oven to 130°C before withdrawing the vapour sample from the jar increased the sensitivity of the "head space" technique by a factor of about ten. It was also found that much smaller quantities of materials could be used. In many cases a conclusive identification could be made from the vapours alone, making the lengthy process of recovering liquid samples by steam distillation unnecessary.

These procedures shorten the time required in handling suspected arson cases and provide more definite results. However, they require more careful collection of samples by investigators. Samples should preferably be collected in mason jars because transfer from other containers to the mason jars used in the laboratory procedure lessens the possibility of detection of accelerants. The seals on mason jars or other containers should not be made of rubber because petroleum products dissolve rubber and contaminate the sample. With these very sensitive methods of detection, it is imperative that control samples and questioned samples be isolated from each other, since the slightest contamination of vapours will be detected.

This improved procedure was used in the following case:

A million dollar fire was set in a northern Ontario high school when xylene was taken from the Biology supply room, spread on the floor and drapes of the gymnasium and ignited. A gallon jug was recovered intact and a small quantity of the contents was submitted as a control sample.

The aromatic petroleum product, labelled xylene, contained in fact three different forms of xylene as well as toluene and benzene. This mixture is readily differentiated from other petroleum fractions and has limited applications compared with most petroleum products.

A trace of aromatic petroleum product was recovered from wood chips taken from the gymnasium floor and from the shirt of the accused. This had the same distinctive composition as the



control sample. Without the more sensitive method of analysis, these traces could not have been detected.

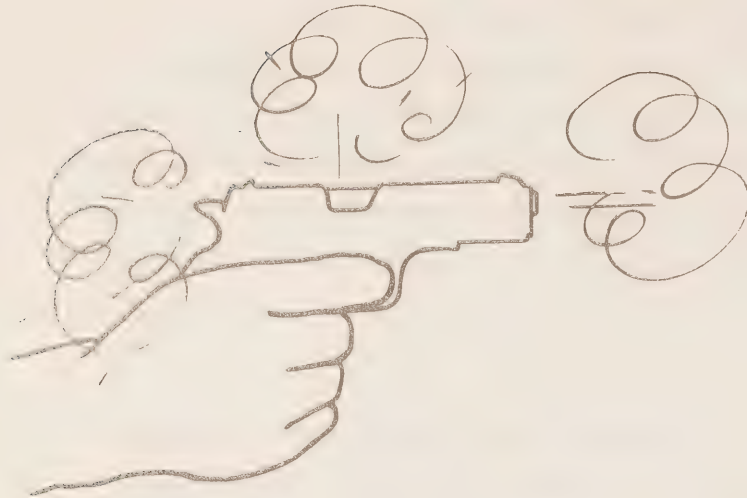
#### Other Activities

A reference collection of automobile paint from damaged motor vehicles of domestic and foreign make has been made in order to provide us with "real world" samples to use in the identification of makes and models. Emphasis is placed on the priming system used. A questioned paint sample may be compared with the reference collection and a rapid identification of make and model made. Not all automobile paints have distinctive and readily identifiable priming systems. Those which do not, still require examination of the "finish" coat.

#### Publications

1. "Determination of Aluminum in Biological Materials"  
S. S. Krishnan, D. R. Crapper, K. A. Gillespie;  
Analytical Chemistry 44, 1469 (1972).
2. "The Merits and Demerits of Forensic Activation  
Analysis when Compared to Other Techniques"  
S. S. Krishnan;  
Proc. of the 2nd International Mtg. of For.  
Activation Analysis, Glasgow, Scotland, Sept. (1972).
3. "Comparison of Single Stranded Copper Wires by  
Spectrochemical Analysis using Copper Fluoride  
as a Carrier"  
R. K. H. Chan, A. H. Li;  
J. Forensic Sciences, 18, No. 3, p. 271, July (1973).
4. "The Identification of Lubricating Oils on Clothing  
by Column Chromatography, Infrared Spectroscopy  
and Refractometry"  
I. H. Yip;  
J. Forensic Sciences, 18, No. 3, p. 263, July (1973).

## Firearms and Toolmarks



One of the most important questions in many shooting cases is whether a person has recently fired a gun; for example, whether a death by shooting was the result of suicide or murder. If there are no firearms discharge residues on the hands of the deceased, he probably did not fire the gun. The "paraffin test" (Dermal Nitrate test) used in the past to detect these residues has long been known to be unreliable. It has been replaced by a trace

element analysis technique which has been extensively evaluated by the Chemistry Section.

It is based on the fact that when a person fires a weapon, barium, lead and antimony are usually deposited on the hands in minute amounts. These elements may be found on the hands of a person who has not fired a weapon, but in significantly smaller amounts and in a different distribution pattern.

This technique has been field-tested with the help of the Metro Toronto Police Homicide Squad and has been found to be useful. It does, however, require great precaution in the collection of the samples by investigators. Because of the small amounts involved, contamination of the samples is a very real problem and results must be very carefully interpreted. To collect the residues, a special kit has been developed and investigators can be trained by the Centre in its use.

Another aspect of the same technique is the use of the presence and distribution of the elements mentioned to determine the muzzle-to-target distance. In a case investigated by the section, a man was charged with murdering his wife. The defence



was that the rifle, contained in its case, went off accidentally and killed the victim from a distance. It became essential for the Crown to establish the muzzle-to-target distance in order to reconstruct the scene and to determine the credibility of the defence. This technique was used to show that, if the shot went through the case, the muzzle-to-target distance was very small. The defence that the shot went off accidentally from a distance was untenable and the accused was convicted.

Documents

455089 G THE MUNICIPALITY OF METROPOLITAN TORONTO DEPARTMENT OF SOCIAL SERVICES L- 67174

AMOUNT **Exactly \$68 and 75 CTS**

PAYABLE TO Jane P Doe,  
(Jane) 100, Dollar Drive,  
Toronto.

ADMINISTERED FOR

THE TORONTO DOMINION BANK  
CITY HALL BRANCH 394 DAY ST

ISSUE DATE  
DAY MO YR  
29 06 73

CASE NO  
428  
403

NOT VALID 30 DAYS AFTER DATE

AUTHORIZED SIGNATURE

AUTHORIZED SIGNATURE

"0067174" 121620041 670 300063 " "0000006875"

INCHES 1 2 3 4 5 6

Many shopkeepers would rather risk getting a "bad" cheque than losing a sale. Relatively few of them insist on satisfactory identification. In any event, many "professional" cheque-passers operate in groups and carry several different sets of forged identification papers. This kind of "ring" which replaced the lone cheque-passer some years ago, has now largely given way to the theft and cashing of government cheques. There are large numbers of these including those mailed to welfare recipients, and the cheque-passer has to write only a signature and not a whole cheque. Our fraudulent Cheque File deals with all three kinds of cheques.

The file was started in 1959, as a small-scale replica of the Fraudulent Cheque File run by the Royal Canadian Mounted Police, to deal with cheques passed in Ontario. Cheques were filed according to categories which resulted from the police investigation e.g. name and modus operandi. The duplication of the Royal Canadian Mounted Police file inherent in this process was stopped in 1971 since that file is national in scope and provides an excellent service. After five years of investigation, a system of classifying the handwriting and other features on cheques was developed in an attempt to supplement rather than duplicate the national file. A computerized programme was set up which worked fairly well. In 1972, it was evaluated and it was found that too much time was being spent on classifying



cheques to meet computer demands and in making comparison with all the cheques designated by the computer output. A system was evolved that would take less time for classification and would produce results faster without a computer. This system was put into effect in September, 1972.

However, the question whether our file really supplemented the Royal Canadian Mounted Police file had still to be decided. An intensive period of testing and evaluating followed in 1973 and it was established that our file does provide a significant supplement to the Royal Canadian Mounted Police file. This was confirmed by the largest user of our file - the Metro Toronto Police Fraud Squad.

Police officers throughout the province should realize that all fraudulent cheques should be sent to the Centre for processing during or after investigation. If this is not done, an officer in one city might be deprived of information regarding the passer of the cheques he is investigating should the same passer have passed cheques in another city. The Fraudulent Cheque File in the Centre is a clearing house for the province. Further, copies of every cheque sent to it are sent to the Royal Canadian Mounted Police for search in the National File.

#### Other Activities

At the annual meeting of the Canadian Society of Forensic Sciences in Regina, Saskatchewan in October, 1973, Mr. Duxbury organized and presided over the formation of a Document Section.

#### Publications

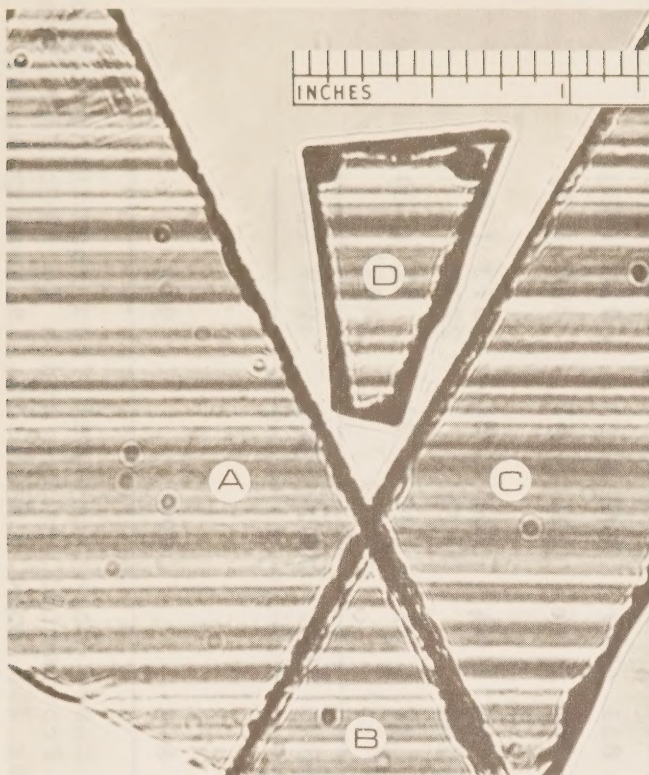
1. "Restoration and Preservation of Typewriting and Printing on Charred Documents"  
A. Bartha (retired);  
A sequel to a previously published paper -  
Can. Soc. For. Sci. Journal, 6, 111 (1973).
2. "Her Pica was Elite and She Walked with a Limp"  
J.A.G. de la Durantaye, D. M. Lucas;  
Crown's Newsletter, September 1973.

#### Presentations

1. "A Revised System of Classifying Type-Styles"  
J.A.G. de la Durantaye;  
Am. Society Questioned Doc. Examiners,  
Washington, D.C., August 1973.
2. "Inconclusive Signature Problems"  
G.W.K. Brohier;  
Am. Society Questioned Doc. Examiners,  
Chicago, Ill., August 1972.
3. "The Document Examiner in Forensic Practice"  
N. W. Duxbury;  
Can. Society For. Science, October 1973.



## Photography



If someone breaks a window pane to gain entrance into a building to commit theft, the chances are good that some fragments of the glass will lodge themselves in his clothing. It was noticed, when photographing such fragments, that they generally had certain structural defects. If a shadow of the fragment was thrown on a photographic film, it would register light or dark streaks on the film. A technique was therefore developed for casting a shadow which could be

photographed. These "shadowgraphs" reveal peculiarities in the manufacture of the glass which occur quite randomly in spite of quality control measures. A single piece of glass 28" long was shown to have considerable variation in the width and spacing of these streaks from one end to the other. Thus it would be possible to say with a high degree of probability whether a fragment found on a suspect's clothing came from a particular window even though the edges of the fragment did not match the damaged portion of the glass remaining in the window. Similar marks have also been shown to exist in bottles and light bulbs.

# PART II

## S T A T I S T I C S

THE CASELOAD AND (STAFF) FIGURES FOR THE LAST FIVE YEARS ARE:

	1969	1970	1971	1972	1973
Biology	560 (12)	587 (13)	663 (14)	680 (14)	767 (16)
Toxicology	3885 (19)	3077 (23)	3341 (24)	3732 (24)	3936 (26)
Chemistry	735 (14)	768 (15)	851 (15)	902 (15)	914 (16)
Firearms	279 ( 5)	350 ( 6)	366 ( 6)	348 ( 6)	390 ( 6)
Documents					
General	487 ( 7)	536 ( 7)	669 ( 8)	708 ( 8)	673 ( 8)
Fraud Cheque File	646	711	1029	2722	2218
Photography	8 ( 3)	15 ( 3)	24 ( 3)	32 ( 3)	21 ( 3)
(For other Sections)	(385)	(394)	(431)	(445)	(439)
T o t a l - (Staff)*	6600 (70)	6044 (77)	6943 (80)	9129 (80)	8919 (84)
*Including Administrative staff.					
Court Appearances	840	803	813	899	950

During the period 1972-73, 25% of our cases were received from Municipal Police Departments. About 20% came from the Ontario Provincial Police and a further 20% from Metro Toronto Police Department. The remaining 35% were submitted, in nearly equal numbers, by pathologists and coroners, other government agencies such as the Fire Marshal's Office and correctional facilities, lawyers and the military.





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